# Abrupt shear thickening and stick-slip behavior of concentrated suspensions in the presence of fluidizer molecules

G.Bossis[1], R.Morini[1],O.Volkova[1] , A.Meunier[1] , J. Persello[1], Y.Grasselli[2]
P.Boustingory[3] ,A.Zubarev[4]

*Email : Georges.Bossis@unice.fr*

[1]*LPMC, Université de Nice Sophia Antipolis Nice, Parc Valrose 06108 Nice cedex 2*
[2]*SKEMA Bachelors – 60 rue Dostoievski – BP085 – 06902 Sophia Antipolis (France)*
[3]*CHRYSO R&D, 7 rue de l'Europe, 45300 Sermaises, France*

[4]*Urals State University, Ekaterinburg, Lenin Ave, 51,Russia*

The fluidizer molecules which are used in cement industry allow to increase the maximum volume fraction of mineral particles in order to improve the mechanical properties of the concrete, still keeping a good fluidity for facilitating the molding of the cement slurries. We study both experimentally and theoretically the effect of fluidizer molecules on the critical shear rate where an abrupt shear thickening transition occurs. A detailed analysis of the forces between polymer molecules adsorbed on the surface of the particles versus their gyration radius allow to predict the value of the critical shear rate. These predicted values are in quite good agreement with the experimental ones obtained in microgravity to rule out the effect of sedimentation. Interestingly, a kind of very regular stick-slip instability where ,at constant imposed stress, the shear rate increases slowly and then falls to zero abruptly before starting again, is observed before the jamming transition. This instability is interpreted through a model taking into account the proportion of frictional contacts between particles as a variable depending on the local stress.